

11. States.

- a) The distribution of state populations is skewed heavily to the right. Therefore, the mean and IQR are the appropriate measures of center and spread.
- b) The mean population must be larger than the median population. The extreme value on the right affects the mean greatly and has no effect on the median.
- c) There are 51 entries in the stemplot, so the 26th entry must be the median. Counting in the ordered stemplot gives median = 4 million people. The middle of the lower 50% of the (26 state populations) is between the 13th and 14th population, or 1.5 million people. The middle of the upper half of the list (26 state populations) is between the 13th and 14th population from the top, or 6 million people. The IQR = $Q_3 - Q_1 = 6 - 1.5 = 4.5$ million people.
- d) The distribution of population for the 50 U.S. States and Washington, D.C. is skewed heavily to the right. The median population is 4 million people, with 50% of states having populations between 1 and 6 million people. There is one outlier, a state with 34 million people. The next highest population is only 21 million.

19. Women's basketball.

- a) Both girls have a median score of about 17 points per game, but Scyrine is much more consistent. Her IQR is about 2 points, while Alexandra's is over 10.
- b) If the coach wants a consistent performer, she should take Scyrine. She'll almost certainly deliver somewhere between 15 and 20 points. But, if she wants to take a chance and need a "big game", she should take Alexandra. Alex scores over 24 points about a quarter of the time. On the other hand, she scores under 11 points about as often.

23. Grapes.

- a) A Seneca Lake vineyard had the maximum case price of approximately \$150.
- b) A Seneca Lake vineyard had the minimum case price of approximately \$50.
- c) The Keuka Lake vineyards were consistently high.
- d) Cayuga Lake vineyards and Seneca Lake vineyards have approximately the same average case price, at about \$100, while a typical Keuka Lake vineyard has a case price of about \$130. Keuka Lake vineyards have consistently high case prices, between \$120 and \$140, with one low outlier at about \$85 per case. Cayuga Lake vineyards have case prices from \$70 to \$135, and Seneca Lake vineyards have highly variable case prices, from \$50 to \$150.

27. Test scores.

- a) Class 3 had the highest mean score, probably somewhere in the 70s. The other two classes had mean scores in the 60s.
- b) Class 3 had the highest median score, probably somewhere in the 80s. The other two classes had median scores in the 60s.
- c) Class 3 has median higher than the mean, since the distribution of scores is skewed to the left. The mean is pulled toward the tail. The other two classes have roughly symmetric distributions, with mean and median approximately equal.
- d) Class 1 has the smallest standard deviation. Most scores are clustered close to the mean.
- e) Class 1 probably has the smallest IQR. However, without the actual scores, it is impossible to calculate the exact IQR of these classes. We can estimate them. Class 1 has 24 students, so Q_1 is between the 6th and 7th scores, somewhere between 50 and 60. Q_3 is between the 18th and 19th scores, somewhere between 70 and 80. The IQR is at least 10 and at most 30. Class 3 also has 24 scores. Q_1 is between 60 and 70. Q_3 is between the 18th score (80-90) and the 19th score (90-100), meaning it could be between 80 and 100. The IQR is at least 10 and at most 40. Class 2 seems to have the largest IQR, of at least 30 and at most 50.

31. Graduation?

- a) The distribution of the percent of incoming college freshman who graduate on time is roughly symmetric. The mean and the median are reasonably close to one another and the quartiles are approximately the same distance from the mean.

b) Upper Fence: $Q3 + 1.5(IQR) = 74.75 + 1.5(74.75 - 59.15)$
 $= 74.75 + 23.4$
 $= 98.15$

Lower Fence: $Q1 - 1.5(IQR) = 59.15 - 1.5(74.75 - 59.15)$
 $= 59.15 - 23.4$
 $= 35.75$

Since the maximum value of the distribution of the percent of incoming freshmen who graduate on time is 87.4% and the upper fence is 98.15%, there are no high outliers. Likewise, since the minimum is 43.2% and the lower fence is 35.75%, there are no low outliers. Since the minimum and maximum percentages are within the fences, all percentages must be within the fences.

- c) A boxplot of the distribution of the percent of incoming freshmen who graduate on time is at the right.
- d) The distribution of the percent of incoming freshmen who graduate on time is roughly symmetric, with mean of approximately 68% of freshmen graduating on time. Universities surveyed had between 43.2% and 87.4% of students graduating on time, with the middle 50% of universities reporting between 59.15% and 74.75% graduating on time.

